

Arizona's Metallic Resources Trends and Opportunities 2007



**Arizona Department of Mines
and Mineral Resources**

**Mining Summary
Exploration Overview
Additional Information Sources**

ARIZONA'S METALLIC RESOURCES TRENDS AND OPPORTUNITIES

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by Nyal J. Niemuth

Arizona Department of Mines and Mineral Resources

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Mining in Arizona

The Southwest is the United States' richest storehouse of metals and industrial minerals and is likely to remain so for many years. **Arizona ranked first in mineral production** in the US in 2006 with a production value of \$6.7 billion according to preliminary unpublished figures of the USGS. Arizona leads the Nation in **copper** and ranked 2nd in **molybdenum** and **sand and gravel** production. It ranks in the top five in **gemstones, perlite, silver, zeolites, and pumice**. Additionally, Arizona produces, or has produced, **zinc, lead, beryllium, vanadium, uranium, tungsten, rare earths, manganese, coal, and at least 18 varieties of industrial minerals**.

In 2005, Arizona accounted for 62 percent of the U.S. copper production. The copper industry has a \$3.5 billion direct and indirect impact on the Arizona economy. Arizona's two largest copper producers, Asarco Inc., and Phelps Dodge also produce significant amounts of molybdenum, gold, and silver as byproducts in the production of copper. Phelps Dodge's Morenci mine produced 815 million pounds of copper in 2006, it has the largest EW plant in the world, and is one of the world's largest copper mines.

Exploration and development increased significantly, coincident with the strong metal prices. This was especially true for copper and molybdenum as those commodities have recently been at record prices and also for uranium reaching an all time high. A newly discovered porphyry copper deposit may be the largest copper deposit in North America. Resolution Copper, a joint venture of Rio Tinto and BHP Billiton, owns the deposit that has at least 1.25 billion tons of mineralization at 1.25 percent or better copper. In 2007, Phelps Dodge will begin operating the first commercial scale copper concentration pressure leach direct electrowinning plant at Morenci, where production of concentrates resumed in 2006. Construction of the Safford Project began mid 2006 following approval by Phelps Dodge's board. Expenditures of \$500 million are expected to build 2 pits, Dos Pobres and San Juan and a massive leaching complex. When complete in the second half of 2008 the project will produce 250 million pounds of copper a year. Quadra's board approved financing of the Carlota copper leach project and construction should begin in 2007.

Although gold takes a backseat to copper production, Arizona has produced over 16 million ounces. American Bonanza Gold Mining recently completed a surface and underground drilling program at Copperstone that defined a resource of over 330,000 ounces of gold.

Arizona Mineral Production

| Commodity | 2004 Value ¹ | 2005 Value ⁴ | 2006 Value ⁴ |
|--------------------------|----------------------------|----------------------------|----------------------------|
| | | | |
| Copper | \$2,130,000,000 | 2,640,000,000 | 5,080,000,000 |
| Gemstones | 1,450,000 | 1,370,000 | 1,370,000 |
| Sand & gravel | 430,000,000 | 516,000,000 | 555,000,000 |
| Stone, crushed | 57,200,000 | 69,300,000 | 61,900,000 |
| Other² | 709,000,000 | 1,120,000,000 | 1,020,000,000 |
| Coal³ | 312,000,000 | 290,000,000 | 190,000,000 |
| Total | \$3,640,000,000 | 4,640,000,000 | 6,900,000,000 |

1) USGS published data

2) Includes cement, clay, lime, gypsum, gold, molybdenum, perlite, pumice, silver, salt, dimension stone, and zeolites

3) ADMMR estimate

4) Unpublished USGS data, subject to change; final 2005 and 2006 data will be published in the Arizona Chapter of the USGS Mineral Yearbook, Area Reports: Domestic 2005 and 2006, volume II

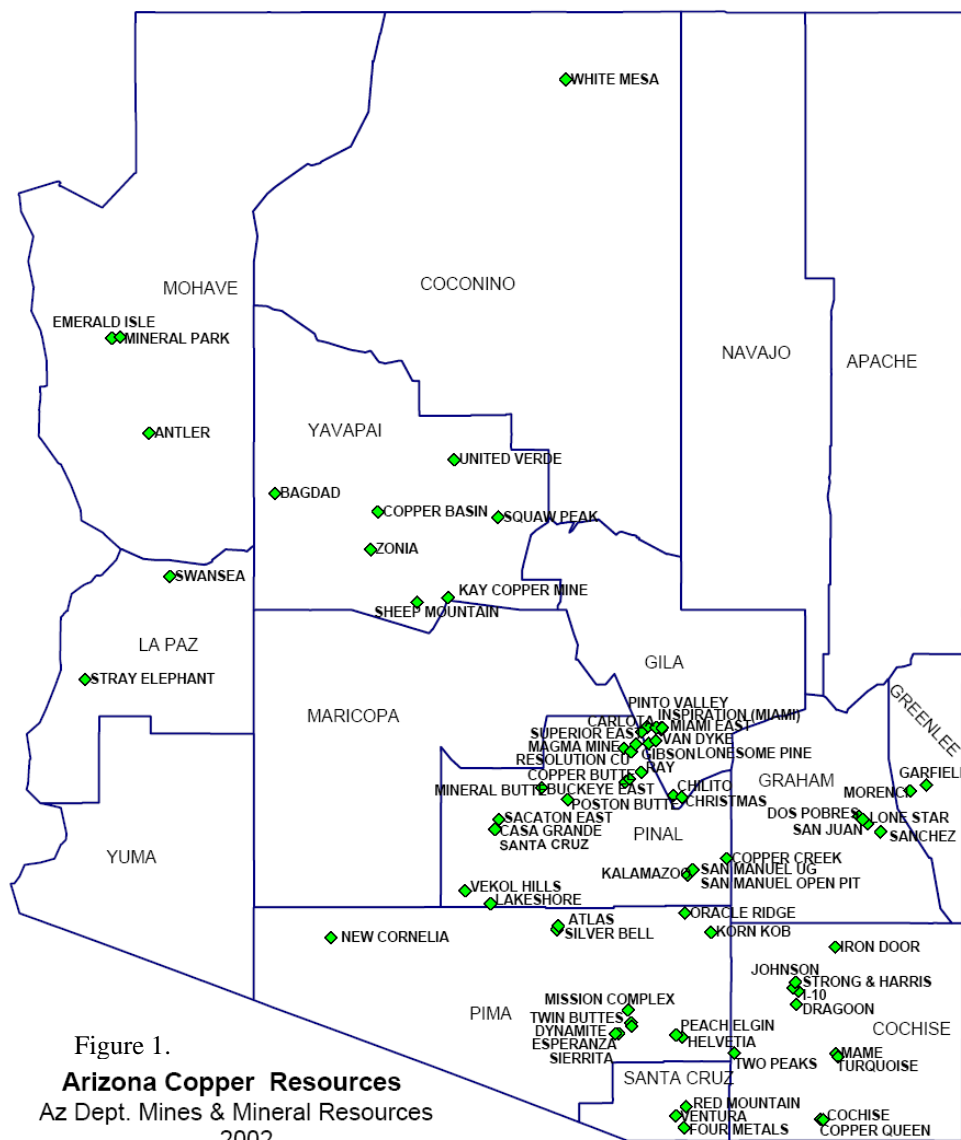
Porphyry Copper

Description: Arizona hosts an impressive number of economically important porphyry copper deposits. Over 90% of the copper deposits shown in Figure 1 are of, or related to, that style of mineralization. These deposits account for a large portion of the current and historic value of mineral production of Arizona. Current production accounts for over 60% of the United States' newly mined copper. Arizona's output reached an all time annual high in 1997 of 2.7 billion pounds while value reached an all time high of \$5 billion in 2006. By-products of mining these porphyry copper deposits have also been significant, accounting for a large percentage of Arizona's gold, silver, and molybdenum production.

General Characteristics: Volumes of literature summarize the characteristics of porphyry copper deposits in general, as well as provide details of many specific Arizona deposits, thus making it unproductive to provide a detailed review here.

History: Deposits with current or recent production include: Morenci, Ray, Sierrita, Bagdad, Mission, Silver Bell, Inspiration, Mineral Park, Pinto Valley, Lakeshore, San Manuel, New Cornelia, Johnson Camp, Twin Buttes, and Copper Queen. Significant deposits awaiting development or redevelopment include: Dos Pobres, San Juan, Lone Star, Sanchez, Rosemont (aka Helvetia), Twin Buttes, New Cornelia, Cochise, Copper Creek, Zonia, and Resolution Copper. Not to be overlooked are Carlota and Emerald Isle, exotic copper deposits derived from porphyry copper systems.

Prior to the last copper price downturn, development of two deposits as in-situ leach operations seemed likely. Although it appears Santa Cruz may become a victim of its high real estate value, a portion of Poston Butte (aka Florence) is an Arizona State Land Dept. mineral lease. The Land Dept. would like to see the 300 million-ton-oxide portion of the deposit begin production. Magma Copper/BHP's feasibility study and technical data may be viewed by signing a release with Merrill Mining/Vanguard Properties.



Highlights of Current Activity: Copper prices that averaged \$3.31/pound in 2006 resulted in a record production value of \$5 billion for copper. Anticipation of continued strong demand is driving a resurgence of acquisition, exploration, and development activity including the entry of a number of new companies.

Morenci: Phelps Dodge and Sumitomo are investing \$241 million to build the first commercial-scale copper concentrate pressure leach operation. Two leach vessels were delivered in the fall and installation is proceeding. Morenci, Arizona's largest mine, resumed concentration in 2006 to supply feed to the new plants. Copper production of cathodes will be via electrowinning from the leach solutions.

Safford Project: Construction of Dos Pobres and San Juan began during 2006 following approval by Phelps Dodge's board. Expenditures of \$550 million will be required to build two open pits and the giant leach pad and SX-EW complex. When completed in mid-2008 the project is expected to produce 250 million pounds of copper a year for at least 18 years.

Mineral Park: While continuing to mine, leach, and produce cathode copper via SX-EW, Mercator pursued plans to acquire and install a concentration plant. The company produced a pre-feasibility study evaluating the economics of concentrating copper and the deposit's high grade molybdenum. After its relocation of a 20,000 TPD concentrator acquired from Asarco was halted by an injunction related to the latter's bankruptcy, Mercator proceeded with plans for an even larger expansion. The company has completed financing efforts for a two-stage expansion for a 50,000-TPD mill. Orders were placed for the larger SAG and ball mills. Start-up is planned for the second quarter of 2008.

Searchlight Minerals has assembled a 2,000 acre prospect that includes the Alum Wash/Apex Hill zone and a number of historic mines immediately north of Mineral Park and is seeking a partner for additional exploration.

Carlota: In late 2005 Quadra Mining acquired the mine, mining equipment, and a SX-EW plant for \$37.5 million US in cash and gold from Cambior. Following additional drilling the company completed a new NI43-101 report and announced a copper oxide resource of 85 million tons. Quadra's board recently approved raising the money for the SX-EW leach project. Initial capital costs are estimated to be \$189 million. Mobile equipment is expected to be arriving and assembled on site soon.

Rosemont: Augusta Resource acquired the Rosemont property in June 2005 and has since completed a 30,000-meter drill program to produce a NI43-101 compliant resource estimate. The company is currently conducting a pre-feasibility study of a 60-80,000 TPD copper molybdenum project. A preliminary, progressive, mining plan has been submitted to the Coronado Forest for mine dumps and plant. Augusta Resource obtained rights to Central Arizona Project (Colorado River) water and to begin storage of water in early 2007 for later withdrawal. Plans include filtering to produce "dry tailings" of less than 15% moisture to reduce water usage. Tailings will be disposed of with the carbonate rock waste that will minimize future acid mine drainage impacts on ground water quality.

Resolution Copper: This deposit, with its large size and high primary grade, continues to inspire exploration in Arizona. Preliminary reports indicate a 1.25 to 1.75 billion-ton deposit grading 1.25% - 1.75% copper plus molybdenum. Resolution Copper Co., a 55/45 joint venture of Rio Tinto and BHP-Billiton owns the property. Surface directional drilling resumed in February 2005 and is continuing. Only 45 holes had been drilled prior to December 2006. Exploration and related expenditures are expected to exceed \$100 million. Plans to deepen the No. 9 shaft and other mine development studies are ongoing. These will address the high rock temperatures and stresses anticipated in the 5,000' deep deposit. Rehabilitation to upgrade the Neversweat tunnel and dewatering of the Magma mine are underway in preparation for deepening the No. 9 shaft.

Copper Creek: Two companies are active in this district. Redhawk Resources has acquired a large portion of this district consisting of high-level breccia pipes and lower level porphyry copper targets. The company recently conducted re-logging and sampling program of 80,000 feet of existing core to complete a NI43-101 compliant resource estimate for Mammoth, Childs-Aldwinkle, and Old Reliable and Keel zone. Redhawk announced a 10,000 feet core-drilling program to begin at the Mammoth deposit. Goals are to expand the deposit, test the deeper Keel zone and to drill across the breccia structure to test contact zones.

Bell Resources began a 10 hole, 4,500-foot drill program on the Sombrero Butte property including portions acquired from Silver Nickel Mining. Results reported have included grades of 4.7% copper over plus 20 meters. These and other encouraging results are extending the drilling program into 2007.

Emerald Isle: St. Genevieve Resources (SGV) acquired this exotic oxide copper deposit with a small “mothballed” SX-EW plant and plans to return it to production. The company has been studying the Zonia mine in Yavapai County and is also seeking to acquire an in situ leaching project.

Monitor: General Minerals optioned this property, located near the Ray mine, to Teck Cominco who completed a six-hole, 1,160-meter diamond drill program to test previously identified copper and silver targets. Teck dropped their interest after releasing mixed drill results. Big Bar Gold recently optioned the nearby Troy prospect from Silver Nickel Mining.

Safford District: In addition to the major construction project by Phelps Dodge there is much exploration activity in the district. Phelps Dodge began a 600,000-foot drilling program near the San Juan and Dos Pobres deposits. Franconia Resources started a core-drilling program on Red Knoll following up on a 4 line 17 km geophysical (Titan 24 IP) survey. Four holes totaling 10,000 feet are planned. At Sol Dos Entrée Gold conducted 13 miles of IP and magnetic geophysical lines to define drill targets. General Minerals has optioned the Markham Wash property to Teck Cominco. Platinum Diversified Mining/Nord reported it will do IP work followed by drilling in 2007 on Coyote Springs. Southwest Exploration Group has done work identifying three targets available for additional exploration. They include the untested Mine Wash in the northwestern portion of the district, Safford West covering an IP anomaly buried by younger alluvium, and the Teague Springs prospect.

Turquoise district: Aurelio Resources signed a purchase agreement to acquire Hope Mining and Milling’s patented mining claims at Courtland Gleason. It announced approximately 50 million tons of near surface copper oxide resources. The company began a 7,500-foot core-drilling program designed to confirm and expand prior work from 170 historic drill holes from the MAN and Courtland properties.

Sheep Mountain: Lone Tree Exploration LLC has acquired the property and assembled historic exploration and drill data. Structural complexities and Miocene volcanism suggest areas of interest. The property is available for parties interested in further work. Lebon Gold optioned a second area of mineralization, to the west, from Minquest. A drill program of 3 to 8 holes is planned to begin early in 2007.

Others: Big Bar Gold completed a 19-hole -drill program at Yuma King that extends known mineralization of the small, but high grade, 3.0%, copper deposit. Southwest Exploration Group acquired the Mohave porphyry copper and oxide prospect in the Hualapai Mountains and assembled historic data. Five targets comprising both exposed oxide and deeper sulfide mineralization have been identified and are available for exploration. At the Sunnyside area American Copper Company is planning to drill to confirm resource figures from a previous feasibility study by Essex. American Copper also has interests in the Patagonia and Globe Miami areas. The company is actively seeking additional properties.

Black Pearl Cons. has leased the Four Metals mine and has permitted a drilling program but is awaiting arrival of a drill rig. Az-Tek Oxide is seeking parties interested in the copper and iron potential of the Mineral Hill detachment fault hosted property. Quaterra recently staked the Peg Leg porphyry a large copper prospect in central Arizona located adjacent to a former Exxon drill target. Bell Resources has conducted airborne and IP geophysics along with geochemistry to identify drill targets at its Kabba porphyry copper target. Additional areas of activity include, but are not limited to Copper Mountain, Maynard, Mineral Creek, Pioneer, Tombstone, and Wallapai districts.

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Uranium

Description: Arizona has significant uranium reserves and the potential for new resources grows as exploration increases. Most of Arizona's uranium production is attributed to deposits located in the southwestern corner of the Colorado Plateau Uranium Province. Arizona was one of the leading supplier's of uranium in the United States between 1980 and 1989, producing more than 13 million lbs of U_3O_8 from only four high-grade breccia pipes that averaged 0.65%. With today's market, Arizona's high-grade breccia pipes are extremely attractive exploration targets.

General Characteristics: The uranium deposits in Arizona occur in four geologic environments: solution collapse breccia pipes, roll front fluvial deposits in sandstone, deposits associated with lacustrine/paludal sedimentary facies, and metasomatic related vein deposits.

History: The first uranium production in Arizona was in 1918 from carnotite bearing sandstone deposits located in the Carrizzo Mountains. Arizona reached its peak of production in 1958 with an all time yearly high of 1.6 million lbs of U_3O_8 from 82 operating uranium mines. Between 1947 and 1970 Arizona produced more than 18 million lbs of uranium oxide and 42 million lbs of vanadium oxide.

Market decline forced a reduction in uranium exploration and mining in the early 70s and again in the 90s. The late 70s and early 80s marked renewed interest in Arizona's uranium potential with the discoveries of high-grade breccia pipes. Previously mined breccia pipes include the Orphan, Pigeon and Hack deposits with total production exceeding 17 million lbs of U_3O_8 . Renewed exploration in the Date Creek Basin resulted in a major discovery. Estimates based on drilling done by U.S. Department of Energy in the 1970s indicate that the Date Creek Basin Miocene lacustrine sediments may host 1.2 billion pounds of U_3O_8 at depths up to 3,500 feet.

Current Activity - Breccia Pipes:

Exploration projects in the northwestern corner of Arizona continue to delineate prospective high-grade uranium bearing breccia pipes. The pipes are structures formed when sedimentary strata collapsed into caverns formed from the dissolution of the underlying Mississippian Redwall limestone. The pipes are generally 300 feet in diameter and may extend 3000 feet vertically. Thousand of these collapse structures exist in northern Arizona and the potential for new discoveries of high-grade uranium deposits is excellent. A dozen plus exploration groups are aggressively acquiring land and staking claims. Hundreds of surface structure and mineral anomalies have been discovered. Extensive geological and drilling work is being done to confirm collapse structures and mineralization.

International Uranium (Denison as of December 2006) anticipates its developed Arizona One (grade 0.65 %) property will be on-line in summer 2007. Denison also controls the developed Pine Nut and partially developed Canyon Pipe (grade 0.95%).

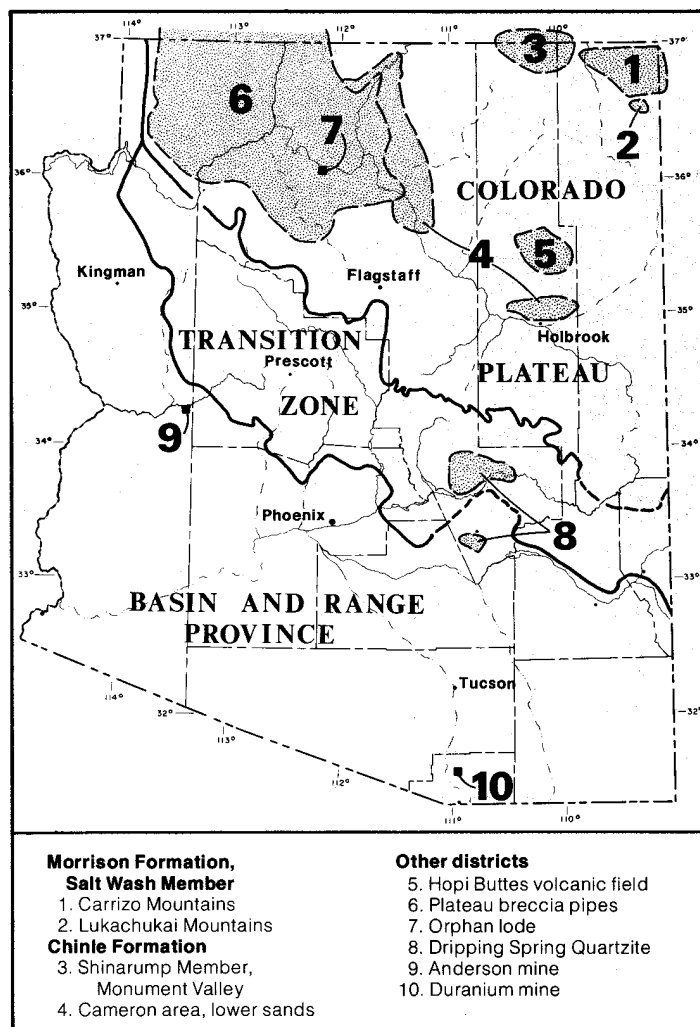


Figure 2. Areas of Uranium Production and Occurrences – From Fieldnotes Vol. 10 no. 4

Liberty Star Gold continues exploration on its holding in northern Arizona, with drilling underway on three of its most prospective targets. Tournigan Gold and its U.S. partner Sweetwater River Resources have identified 79 targets. Vane Resources has four confirmed breccia pipes and received approval for drilling at its Miller and Red Dike properties. Quatterra plans to evaluate eight targets. U.S. Energy has 27 targets to be evaluated; drilling early in 2006 confirmed two breccia pipes. Quincy (now Energy Metals) completed exploratory drilling on the Rose pipe and is evaluating core samples and logging results.

Current Activity - Metasomatic Veins: The Dripping Springs Quartzite in central Arizona is a past uranium producer. High prices for uranium have created a flurry of activity to acquire and stake historic deposits and explore for new mineralized ground. The uranium occurs as veins located within low grade metamorphic rocks of Proterozoic age. The ore zones are typically stratabound and occur near diabase dikes and sills. Past production averaged 0.12 % to 0.22 % uranium. Estimates from drilling done in the 70s indicate resources of over 9 million pounds of uranium. Golden Patriot's multi-hole drilling project, on the past producing Lucky Uranium Mine, has returned positive results showing uranium grades from 0.12% to 0.13%. Past production from the mine included more than 2,000 tons of 0.16 % ore in the 1950s and 10,000 lbs of U_3O_8 from heap leach operations in 1979. Rodinia Minerals, Yukon Resources, and Uranium Core have acquired properties in the Sierra Ancha Mountains. Previous production from the area includes the Workman Creek and Red Bluff mines totaling more than 115,000 lbs of U_3O_8 .

Current Activity - Lacustrine/Paludal Type: There are a number of past producing mines and previously drilled properties that have been acquired in the Date Creek Basin of west central Arizona. These properties are situated within Miocene lacustrine/paludal sedimentary rocks. The uranium mineralization occurs as stratabound units in carbonaceous siltstones and mudstones. These sedimentary rocks were deposited in small alkaline, saline lakes at the edge of a large alluvial fan. Uranium mineralization is related to the calcrete deposit model that is associated with some of the largest uranium resources in the world. Concentric Energy is evaluating extensive historic data on the past-producing Anderson Mine. Confirmation drilling completed in late 2006 verified 43% of historic resource estimates. Universal Uranium acquired properties further west in the Artillery Peak area, also within the Date Creek Basin. It has uranium mineralization and stratigraphy similar to the Anderson Mine.

Current Activity - Roll front/Fluvial deposits: Exploration and drilling activity is underway at Promontory Butte, a past producer, in the Mogollon Rim country of central Arizona. The host rocks for the deposit are the Pennsylvanian and Permian age Supai group. Mineralization is associated with coalified plant remains and is located in fluvial channels with variable lithology grading from black shale to conglomerate. Rodinia Minerals drilled its Mormon lake property to test stratigraphy and mineralization outlined in historical data from previous exploration companies.

Arizona's Exploration Potential: The northwestern corner of Arizona is host to an impressive number of breccia pipes. Geological investigations done in the Hualapai Reservation alone show over 900 pipes with approximately 8% of them having recognizable mineralization or anomalous gamma radiation. The potential for the discovery of high-grade uranium breccia pipes, that can be mined, is enormous. Resource studies show that the Date Creek Basin may contain large, low-grade resources on the order of 1.2 billion lbs of uranium. The Mogollon Rim in central Arizona has an 80-mile escarpment of Paleozoic rocks with anomalous radioactivity and widespread uranium mineralization. Excepting Promontory Butte, little systematic exploration of the area has been occurred. In southern Arizona drilling in the 1970s discovered some uranium potential in the granite shear zones of the Rincon Mountains. The Whetstone range has similar geologic structures. Fueled by high uranium prices exploration for uranium in Arizona is at level not seen since the uranium boom of the 1950s.

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Gold

Description: Arizona's cumulative gold production exceeds 16 million ounces contributed from 219 metallic mineral districts. Twenty-six of those districts have produced more than 100,000 ounces and 46 have produced more than 10,000 ounces. Gold recovery has been from a wide variety of deposit model types with the most important being epithermal (quartz adularia) veins, the more recently recognized detachment fault-associated deposits, porphyry copper, and volcanogenic massive sulfide. Economic deposits have formed during four widely diverse geologic periods: Proterozoic, Jurassic, Laramide and Mid-Tertiary.

History: Recent primary producers include: Copperstone - produced 500,000 oz, McCabe (Gladstone), Verdestone, Congress, and Gold Road, the last to operate, closed in 1998.

Resources: A number of deposits with potential to produce a few hundred thousand ounces or more have been awaiting a period of higher prices for their development to occur. These include Yarnell, Newsboy, Moss, Mexican Hat, Tiger, Golden Eagle and Copperstone underground.

Current Activity: Copperstone - American Bonanza completed a 40,000-meter drill program at the detachment hosted Copperstone deposit and in February 2006 announced NI43-101 compliant resource of 330,000 ounces of gold. In July a program was announced to test 10 geophysical and structural step-out targets, zones that have the potential of adding significant new tonnage to the existing mineralization. The initial drilling phase planned an estimated 75,000 feet of RC drilling in 50 holes. Six of the targets tested returned results that warrant follow-up drilling. On a parallel path with the exploration program, Bonanza has collected environmental, geotechnical, hydrological and metallurgical baseline data to support mine permitting and project design. Bonanza plans to expand the mineral resource before making a production decision.

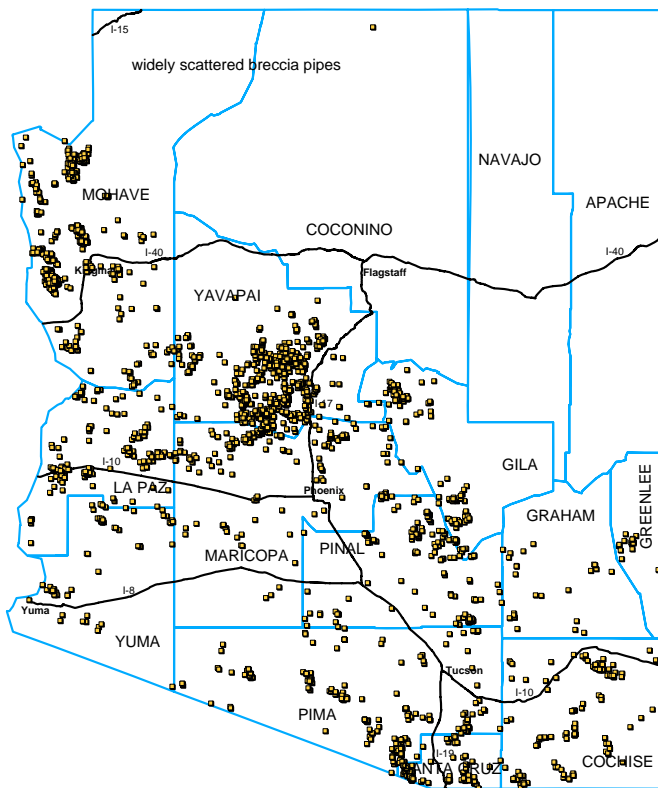


Figure 3. Primary and by-product gold occurrences
From: Arizona Dept. Mines and Mineral Resources AzMILS

Other properties: Columbus Gold is exploring four projects in western Arizona: Clara Moro, Burnt Well, Silver District and Clanton Hills. The company's exploration work and project generation activities are carried out by Cordex Exploration. Patriot Gold resumed drilling on the Moss mine in the Oatman district. Further north in the Black Mountains the Van Deeman was optioned by Tonogold Resources. Teryl Resources optioned the Gold Hill patented claims and conducted reconnaissance sampling along fault structures. On the predominately silver Hardshell property, Wildcat Resources re-assayed cuttings and plans drilling to confirm previous Asarco resources.

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Descriptive model of detachment fault related polymetallic deposits –
http://pubs.usgs.gov/bul/b2004/html/bull2004detachmentfaultrelate_polymetall.htm

Volcanogenic Massive Sulfides

Geology: Volcanogenic massive sulfide occurrences of Arizona formed 1.7 –1.8 b.y. ago. Deposits occur as stratabound-strataform accumulations of iron and base-metal sulfides with variable amounts of gold and silver. They are hosted in a thick sequence of submarine volcano-sedimentary strata metamorphosed to greenschist and occasionally amphibolite facies.

Economic Geology: Of the 70 known VMS deposits, 48 have reported production. Cu-Zn mineralization with precious metals is economically important in these deposits. Production totals over 55 million tons and three deposits have yielded over 4 million tons each. The majority of the production is from the Verde district. The United Verde mine is reported to currently contain over 20 million tons of mineralization grading 6.6% Zn plus Cu and precious metals.

Structure and Distribution: Most orebodies are highly deformed and exhibit high ratios of plunge to strike length. Larger deposits are described as elliptical lenses, or rod like bodies, that plunge steeply and parallel major or minor fold axes. The United Verde mineralization is located within the axis of a major steeply plunging fold. Ratios of plunge length to strike ratio of 3:1 are common and ratios as high as 8:1 are known. Thus most deposits present only limited surface expression. The geographic extent of

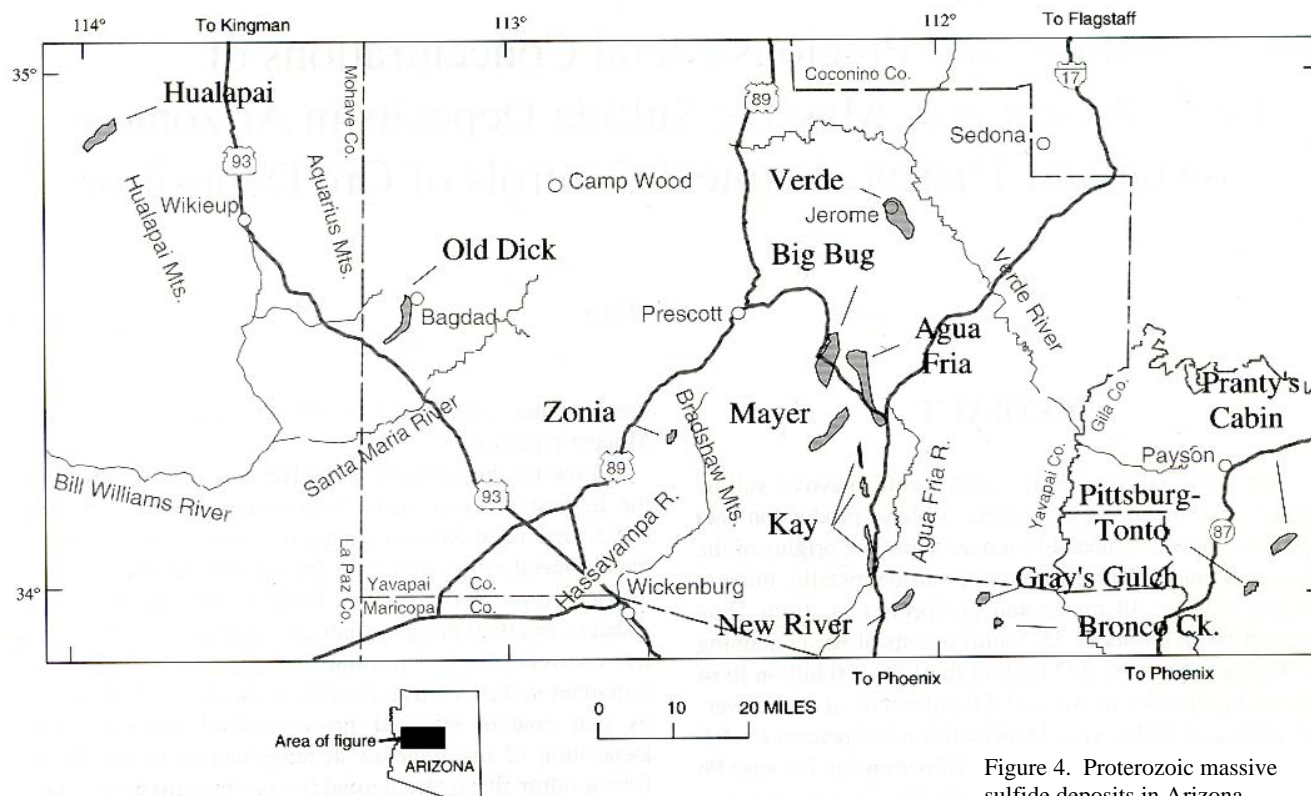


Figure 4. Proterozoic massive sulfide deposits in Arizona.
From: USGS Bulletin 2138.

favorable host rocks is wider than that of known VMS deposits suggesting exploration potential for new discoveries. Lindberg suggested a number of exploration ideas and targets that remain untested.

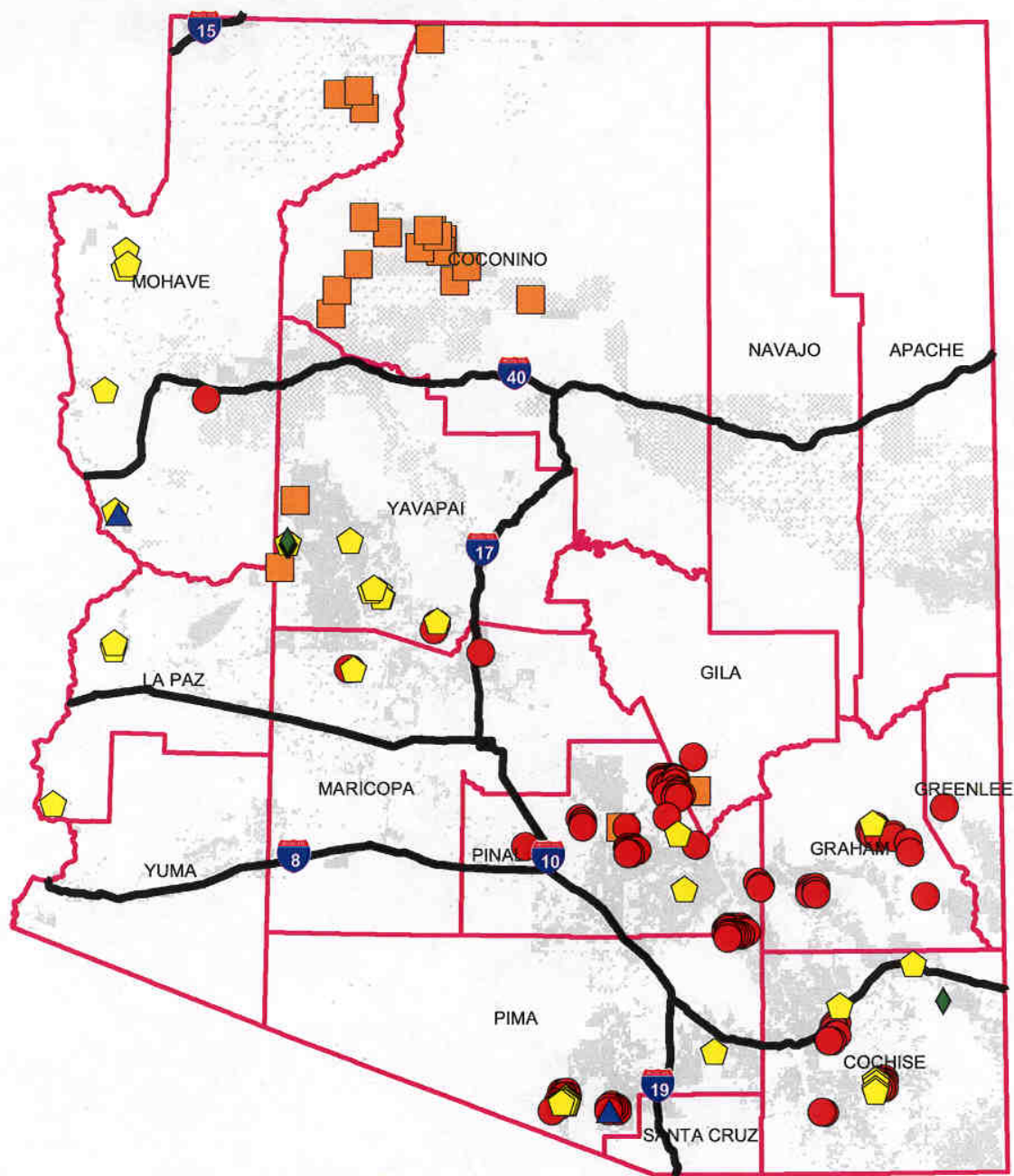
Current Activity: Although past exploration by majors generated much data (see ADMMR files) in the VMS districts, these areas are currently under explored (Figure 4). Many promising prospects, not limited to the few described here, are available. Phelps Dodge controls the United Verde zinc resource discussed above. Teck Cominco recently completed a multi-year effort there without releasing results. In the Old Dick district Silver Nickel Mining has acquired the Pinafore mine (Cu-Zn) and collected

exploration data including drill results from Arizona Explorations Inc's. (syndicate of American Barrick, Homestake and Placer Dome) mid-90's effort. The joint venture of Ivy Minerals and Kaaterskill Exploration (IKE JV) has generated geochemical and VLF-EM anomalies within fold axes on two new exploration targets in the Mayer district known as the Cobre Sud and Cordes Peak prospects. These properties are currently available for lease-option agreement to a company willing to accept a work commitment that includes a drill program. Ricks Brothers Enterprises controls a copper resource near Mayer with both disseminated and limited massive mineralization and have project data available. Searchlight Exploration's Treasure King has a 150,000-ton deposit at a grade of 0.06 oz/ton gold proven resource along with four additional areas untested by drilling. The Kay mine has a Cu-Zn resource defined by Exxon and Rayrock with drill data available at ADMMR.

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Metal Exploration Permits on Arizona State Trust Lands - 2006



LEGEND

COMMODITY



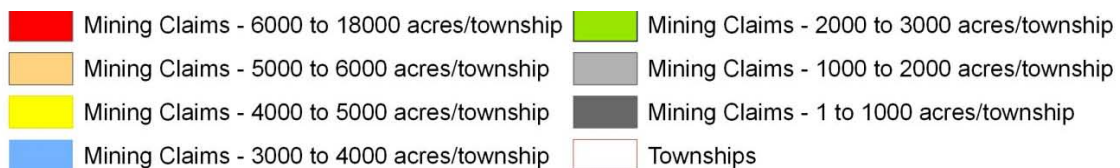
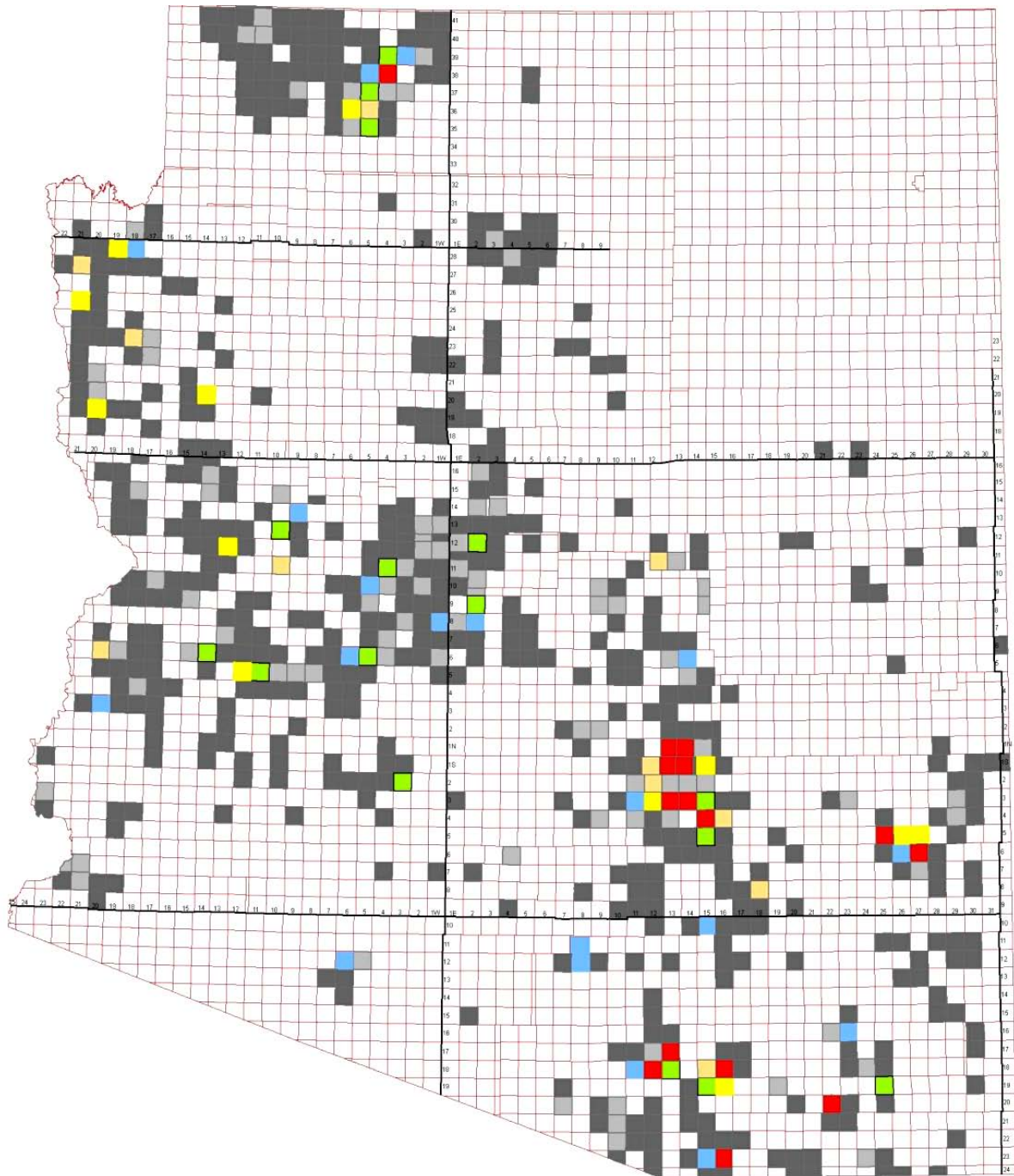
The Arizona State Land Department makes no warranties, implied or expressed, with respect to the information shown on this map.

Map produced by the Arizona State Land Department
February 22, 2007

Q:\huerfno\projects\Keenan\MetalExploration.mxd
Ron Huettnr

State Trust Land

Mining Claim Distribution on Federal Lands



United States Department of the Interior
Bureau of Land Management
Arizona State Office
Map created on Dec 4, 2006



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by the BLM.

25,600 mining claims in 2004
31,000 mining claims in 2005
35,000 mining claims in 2006

Mining claim records are online at:
www.blm.gov/lr2000 (database)
www.geocommunicator.gov (mapper)



Arizona Department of Mines and Mineral Resources

1502 West Washington, Phoenix, AZ 85007 Phone (602) 255-3795

1-800-446-4259 in Arizona FAX (602) 255-3777 www.mines.az.gov

PUBLICATIONS - PARTIAL LISTING, January, 2007

ORDERING INSTRUCTIONS -Prepayment is required on all orders. Make checks payable to the Arizona Dept. of Mines & Mineral Resources.

POSTAGE and HANDLING - Orders are shipped First Class or Priority Mail. If your total order is:

\$0.50 - \$5.00, add \$1.50

\$20.01 - \$30.00, add \$5.50

\$5.01 - \$10.00, add \$3.00

\$30.01 - \$ 40.00, add 6.00

\$10.01 - \$20.00, add \$4.50

\$40.01 - \$50.00, add 6.50

Over \$50.01, add 15% of total

Photocopies of out-of-print publications are available for \$.15 per page (see OFR90-5 and OFR04-21).

(*) Indicates that the publication is available on the Department website.

DIRECTORIES

D49 Directory of Active Mines in Arizona - 2001/2,

K.A. Phillips, N.J. Niemuth, D.R. Bain, The listings are alphabetical, giving company name, address, key personnel, mine name, and location. A separate listing of sand and gravel operations is provided. Includes 1:1,000,000 scale map showing the locations of the active mines and mine offices. 34 p. \$6.00

D50 Arizona Mining Consultants, N. J. Niemuth, 2004.

A listing of Arizona-registered consultants for the following mining related disciplines: assayers, geological engineers, geologists, geophysical engineers, metallurgical engineers, and mining engineers. 22 p. \$3.00

SPECIAL REPORTS

SR1 Uranium Prospector's Guide, by K.A. Phillips & M.N. Greeley, 1979. A guide for the independent prospector searching for occurrences of uranium. Chapters on mineralogy and geology of uranium and prospecting methods. 34 p. \$6.00

SR12 Laws and Regulations Governing Mineral Rights in Arizona, by V.H. Verity and L.D. Clark. 9th Edition, reprinted 1988. A lay language interpretation of federal and state laws applicable to mineral rights within Arizona. Includes discussions and forms for locating (staking) and maintaining claims on both public domain and State-owned lands. 91 p. \$8.00

SR23 Manual for Determination of Status and Ownership, Arizona Mineral and Water Rights, by J.C. Lacy, 1999. A detailed explanation of land, mineral rights and water rights ownership status. Includes annotated samples of status maps and indexes. 29 p. \$3.00

MINERAL REPORTS

See OFR92-10 Copper Oxide Resources, and **OFR01-17 Arizona Copper Reserves**

MR3 Molybdenum Occurrences in Arizona, by C.J. Hicks, 1979. Occurrences are listed by county with a brief description of each. The mineralogy, geology, uses and history of molybdenum are provided. 37 p. \$6.00

MR4 Arizona Industrial Minerals, by K.A. Phillips, 1987. Covers 1400 known Arizona industrial mineral

occurrences. Includes location tables and maps. 185 p. \$12.00

MR7 Gold Panning in Arizona, by D.R. Bain, 1990.

Includes the origin of placer gold in Arizona, prospecting tips, panning instructions, and maps to panning locations. 30 p. \$3.00

COUNTY MINE MAP SERIES

| Number-County | Number of Maps | Index Pages | Mines | Price \$ |
|-----------------------------|----------------|-------------|-------|----------|
| CM-1 - Apache | 18 | 6 | 353 | 15.00 |
| CM-2 - Cochise | 9 | 16 | 698 | 10.00 |
| CM-3 - Coconino | 28 | 11 | 594 | 20.00 |
| CM-4 - Gila | 9 | 19 | 731 | 10.00 |
| CM-5 - Graham/ Greenlee | 12 | 16 | 516 | 15.00 |
| CM-6 - La Paz/Yuma | 15 | 15 | 583 | 15.00 |
| CM-7 - Maricopa | 11 | 20 | 915 | 15.00 |
| CM-8 - Mohave | 20 | 31 | 1,411 | 25.00 |
| CM-9 - Navajo | 17 | 5 | 232 | 15.00 |
| CM-10 - Pima/ Santa Cruz | 14 | 34 | 1,487 | 20.00 |
| CM-11 - Pinal | 9 | 29 | 1,024 | 15.00 |
| CM-12 - Yavapai | 12 | 46 | 1,948 | 20.00 |

Each map set includes a geographically sorted mine index that lists AzMILS number, primary mine name, alternate names, a file reference, topographic quadrangle name, township, range, section, quarter section, and up to 7 commodities. Over 10,400 locations cover the entire series of 12 sets for Arizona's 15 counties. Samples of the maps and indexes may be viewed at the Department website.

Digital Data Files

Complete databases of the information for the state are available as dBase files on a CD-ROM disc. The databases can be sorted on any field or combination of fields, including commodities. Bibliographies include reference information on individual mines. \$20.00

OPEN-FILE REPORTS

OFR 90-5 Publications of the Department of Mines and Mineral Resources from 1939 to 1990, by D.R. Bain , 1990. 15 p. \$2.50 *

OFR91-8 Pumice and Pumicite in Arizona, by J.M. Hoffer, 1991. Describes over 50 pumice occurrences in Arizona. Includes deposit map, scale 1:1,000,000. 67 p. \$10.00

OFR92-10 Copper Oxide Resources, by N.J. Niemuth and K.A. Phillips, 1992. A listing of over 800 Arizona deposits that contain copper oxide. 18 p. \$5.00

OFR93-12 Economic Geology of the Sierra Estrella, Maricopa and Pinal Counties, Arizona, by E.B. Melchiorre, 1993. Includes site descriptions of metallic and nonmetallic resources. 29 p. \$2.50

OFR95-13 Listing of the Grover Heinrichs file Collection, compiled by N.J. Niemuth, 1995. 31 p. \$3.00

OFR97-15 The Art of Making a Cabochon, by Walter Peck, revisions by Doug Duffy and Shirley Cote, 1997. 15 p. \$2.40

OFR01-17 Arizona Copper Reserves, An update of OFR92-11. Reserve and ownership information for 80 major copper properties. The information is continually updated. 85 p. \$10.00

OFR02-18 The Crushed Stone Industry Grows Up, A History of Mineral Material Trespass on Public Lands in Central Arizona, by W. Scott Donaldson, 2002. 21 p. \$2.50

OFR02-20 Arizona Mining Scams and Unassayable Ore Projects of the Late 20th Century, by W. Scott Donaldson, 2002. 28 p. \$3.00 *

OFR04-21 Publications of the Department of Mines and Mineral Resources From 1990 to 2004, by D.R. Bain, 2004. 7 p. \$2.50 *

OFR06-23 Arizona's Metallic Resources - Trends and Opportunities, by N.J. Niemuth, 2006. 22 p. Free *

OFR07-24 Arizona Metallic Resources - Trends and Opportunities, by N.J. Niemuth, 2007. 22 p. Free *

CIRCULARS

C3 Platinum in Arizona, by K.A. Phillips, 1980. Answers commonly asked questions about platinum group metals, minerals, and potential in Arizona. *

C36 Arizona Recordation Law Change, 1991, 1991*

C56 Annual Assessment Work Requirements Under Arizona Statute, 1994, An explanation of assessment work requirements by John C. Lacy. *

C59 Mining Scams, by M.N. Greeley, 1995. Discusses common features of mining scams and ways to avoid being a victim of one. *

C63 Reference Material Listing, 1996, ADMMR library holdings on mines, mining, and recovery. *

C91 Assayers and Assay Offices in Arizona, 2001, List of commercial assay laboratories in Arizona with registered assayers. Includes information on the history of assaying and the assaying process. *

C92 Arizona Rockhound Information, by D. R. Bain, Includes information on mine tours, mineral collecting fee areas, gold panning, and a short bibliography. *

C104 Mining Laws and Regulations, Changes and Revisions, 2003, Summarizes recent changes in laws and regulations governing mineral rights acquisition and surface management regulations. *

C115 Mining Claim Forms, Includes Location Notices for lode and placer claims, Claim Map, Affidavit of Performance of Annual Work, Notice of Non-liability for Labor and Materials Furnished, Notice of Intent to Hold Mining Claims, and Attachment for Additional Claims. *

C116 Arizona Gem Shows, 2006-2007, Includes date, location, sponsoring group, contact person. *

C117 Earth Science Clubs, 2006-2007, Includes , lapidary, and prospecting organizations. *

C118 Arizona Mining Update, 2005, N.J. Niemuth, A review of mining activity in Arizona. Describes copper, gemstone, industrial mineral, and coal mines as well as mineral exploration and government news.*

C119 Listing of U.S. Bureau of Mines Mineral Land Assessments in Arizona, 2006, Contains all MLA Open File Reports conducted in Arizona. *

C120 State Agencies Concerned with Mining & Mineral Resources in Arizona, 2007, Contains names, addresses, and pertinent people at state agencies concerned with mines and mineral resources. *

C121 Federal Agencies Concerned with Mining in Arizona, 2007, Contains addresses of Bureau of Land Management, Forest Service offices, and other Federal agencies. *

C122 County Agencies Concerned with Mining & Mineral Resources in Arizona, 2007, Includes a listing of addresses, phone numbers, and websites . *

MAPS

All maps are shipped folded. Contact the Department to special order rolled maps or a different scale or media.

MM-17 Metallurgical Provinces of Arizona, by P.F. O'Hara, N. J. Niemuth, and G. Ryberg, 1989. Scale 1:1,000,000, Preliminary edition showing 49 metallogenic provinces in Arizona. Blackline \$2.50

MA-49 Active Mines in Arizona, 2001-2, by K. Phillips, N. Niemuth, D. Bain, 2002. Scale 1:1,000,000. Shows the locations of the active mines (excluding sand and gravel), plants, and mine offices. (Also included in the Directory of Active Mines.) \$2.50

M02-2 Map of Arizona Copper Resources, by N.J. Niemuth, 2002. Scale 1:3,000,000. Provides names and locations of principal deposits. Order OFR01-17 for details of the deposits. \$.50 *

In addition to the Department of Mines and Mineral Resources, many other Arizona agencies and organizations cooperate to encourage and support Arizona's mining industry. The Department wishes to thank the following organizations for providing information for PDAC 2007.



**Arizona Department of
Commerce**



Arizona Geological Society



Arizona Geological Survey



Arizona Mining Association



BLM Arizona



**State Land Department -
Minerals Section**



**University of Arizona,
Institute for Mineral Resources**

THE IMPACT OF THE COPPER INDUSTRY ON THE ARIZONA ECONOMY

- ◆ In 2005, the Arizona copper industry had a combined direct and indirect impact on the Arizona economy of:

\$3.518 Billion

- ◆ including combined direct and indirect contributions of:

| | |
|------------------------|----------------------------------------------------------------|
| \$1.096 Billion | in personal income, equivalent to 18,000 jobs for Arizonans |
| \$2.199 Billion | in business income, and |
| \$223 Million | in state and local government revenues |

- ◆ as a result of the circulation (and multiplication) of the copper industry's total direct impact of

\$1.605 Billion

- ◆ that included direct payments of:

| | |
|---------------------------|--------------------------------------------------------------------------------------|
| \$80.089 Million | to the State and its local governments in taxes and fees, |
| \$1038.269 Million | to other Arizona businesses for products and services, and |
| \$486.611 Million | in personal income for Arizonans, including wages and salaries for the industry's |
| 6,900 | employees |

- ◆ who labored to produce:

765,849 tons of copper and other minerals with a total
value of

\$3.545 Billion

(36% more than in 2004)

Compiled by **WEAC** for the



Arizona Mining Association
5150 N. 16th St., Ste. B134
Phoenix, AZ 85016
602-266-4416 Fax: 602-230-8413
www.azcu.org

Exploration Permits and Mining Leases on Arizona State Trust Land

The Minerals Section of the Arizona State Land Department (ASLD) is responsible for mining/mineral activities on State Trust land. Its primary obligation is to maximize revenues for the Trust from the disposition and management of mineral commodities while considering the long-term best interest of the Trust. Arizona's public schools are the primary State Trust beneficiary.

Mineral commodities are classified into three separate categories:

Hard Rock Minerals refer primarily to *base and precious metals* as well as *industrial minerals* that are unique and distinct.

Common Variety Minerals, also referred to as salable minerals or mineral materials, include *construction and landscaping materials* (cinders, sand, gravel, boulders, loose rock and common clay) and *minerals of similar occurrence* commonly used as aggregate, riprap, ballast, borrow or fill.

Energy Minerals (also leaseable) refer primarily to *oil, gas, and geothermal resources*.

The right to explore for and produce mineral commodities on State Trust land is accomplished by obtaining one of the following mineral-related permit / leases:

- Mineral Exploration Permit
- Mineral Lease
- Common Variety Mineral Lease / Sale
- Oil and Gas Lease

Details for each mineral category can be obtained from ASLD's Minerals Section.

Mineral Exploration Permits

A mineral exploration permit is permission from ASLD to prospect and explore for minerals on State Trust land. Exploration is any activity conducted for the purpose of determining the existence of a valuable mineral deposit, such as: geologic mapping, drilling, geochemical sampling, and geophysical surveys.

Prior to exploration, the Plan of Operations *must* be approved.

- The permitting process for an exploration permit takes a minimum of sixty (60) days.
- If the application is approved, the initial rent is \$2 per acre. If renewed, no additional rents are due for the second year. Rents are set at \$1 per acre for years 3 thru 5.
- Work expenditure requirements are:
 - \$10 per acre for years 1-2; and
 - \$20 per acre for years 3-5.

The permit is valid for one year from the due date of the rental and bond. If renewal requirements are met, the permit can be renewed annually for up to five years. If discovery of a valuable mineral deposit is made, the permittee must apply for a mineral lease before actual mining activities can begin.

External permitting requirements can greatly impact application processing time.

A Pre-Application Conference with ASLD is recommended for the following leases.

Hard Rock Mineral Leases

A mineral lease permits the mining of minerals discovered under the exploration permit it.

- The approval process takes a minimum of six (6) months.
- The mineral lease is issued for a term of twenty (20) years. Leases may be renewed for an additional term.
- Both *rents* and *royalties* are determined by appraisal. Royalties may be based on:
 - 1) a fixed rate subject to annual adjustment; or
 - 2) a sliding-scale rate which is linked to a commodity index price and the operation's breakeven price. There is a statutory minimum royalty rate of 2% of gross value.

Common Variety Mineral Lease

This agreement is for the purchase, mining and processing of common variety minerals (sand and gravel, and other construction and landscape materials). Statutes require these mineral commodities to be sold at public auction. It is the auction process which determines the market value (royalty rate) of the commodity. Statutes require that the sale be advertised for ten (10) weeks prior to the auction. Advertising costs are paid by the applicant. However, should the applicant not be the successful bidder, advertising costs and certain other costs are reimbursable.

- The application approval process takes a minimum of six (6) months.
- An agreement is issued initially for a ten (10) year term with provisions to extend up to a maximum of twenty (20) years.
- *Rents* are based on a percentage of the appraised surface value.
- *Royalty rates* are determined at public auction. A minimum annual production guarantee is assessed for each agreement.

Recreational mining or mineral collecting on State Trust land is prohibited

Oil and Gas Leases

The oil and gas lease is for the exploration and/or production of oil and gas resources. *All drilling must be approved by the Oil and Gas Commission* (through the Arizona Geological Survey) as well as the ASLD.

The permitting process for an oil and gas lease takes a minimum of one (1) month.

- Leases are issued for a primary term of 5 years. A secondary term of 5-years may be requested prior to the expiration of the first term for a maximum of ten (10) years, or so long thereafter as production continues.
- Annual rents are payable in advance at \$1 per acre for the primary term, and \$2 per acre if extended for a secondary term.
- Royalties: 12.5% of the value for all products sold or removed from the lease.

Applicable State Laws

ARIZONA REVISED STATUTES

Title 27: Minerals, Oil and Gas

Title 37: Public Lands

Title 41: State Government

A.R.S. § 41-844 requires parties in charge of ground disturbing projects on State [Trust] land to promptly report the discovery of any archaeological, paleontological or historic site or object to the director of the Arizona State Museum.

ARIZONA ADMINISTRATIVE CODE

Title 12: Natural Resources, Chapter 5

General Requirements

APPLICATION FEE

There is a non-refundable filing fee of \$100 per application.

OTHER FEES

Rental fees are required on all agreements.

Royalties are paid on all recovered mineral products.

Additional fees, such as appraisal or administrative fees, may also be required.

REQUIRED MAPS

A USGS topographic map showing lease boundaries, access routes, roads, utilities, etc., must be submitted with the application. Other detailed maps, related to your operation will be required in a Mineral Development Report.

MINERAL DEVELOPMENT REPORT (MDR)

All mining-related operations require a detailed MDR which includes: 1) geologic assessment, 2) economic feasibility, 3) environmental assessment, 4) mine operations plan, and 5) reclamation and closure plans. Detailed requirements for the MDR are available upon request.

OTHER NECESSARY DOCUMENTS

Exploration permits require a plan of operations. Aerial photos, contour maps and registered surveys may also be required. Surveys of cultural resources, native plants, wildlife, and endangered species are required components.

RECLAMATION BOND

The *minimum* bond required is \$3,000. The actual bond amount is based upon the type of operation and the degree of disturbance.

INDEMNITY INSURANCE

Indemnity insurance will be required for most operations.

OTHER PERMITTING REQUIREMENTS

The applicant is responsible for determining permitting requirements from other regulatory agencies *and* to be in compliance.

For More Information:

Arizona State Land Department
MINERALS SECTION
1616 West Adams Street
Phoenix, Arizona 85007
602-542-4628
fax 602-542-3507
www.land.state.az.us

Other Useful Contacts:

Arizona Department of Mines & Mineral Resources
602-255-3791
www.mines.az.gov

Arizona Geological Survey
520-770-3500
www.azgs.az.gov

Arizona Mine Inspector
602-542-5971
www.asmi.state.az.us

Arizona State Museum
520-621-4011
www.statemuseum.arizona.edu

Bureau of Land Management
Land and Mineral Records
602-417-9528
www.blm.gov

U.S. Geological Survey
520-670-6671 ex. 221
www.usgs.gov

ARIZONA GEOLOGICAL SURVEY

Partial list of Mineral and Energy Resource Publications

Bulletin 180—Geology and Mineral Resources of Arizona, by U.S. Geological Survey, Arizona Bureau of Mines, and U.S. Bureau of Reclamation, 1969 (reprinted 1989), 467 p. [Photocopy only]....\$22.00

Metallic Mineral Resources

Bulletin 194—Metallic Mineral Districts and Production in Arizona, by Stanley B. Keith, D.E. Gest, Ed DeWitt, Netta Woode Toll, and B.A. Everson, 1983, 58 p., scale 1:1,000,000, [includes Map 18]....\$10.00

Map 18—Metallic Mineral Districts of Arizona, by Stanley B. Keith, D.E. Gest, and Ed DeWitt, 1983, scale 1:1,000,000. [also included in Bulletin 194]....\$7.00

Digital Information Series 3—Database Files describing Mineralized Sites in the State of Arizona, v. 1.0, Data structure and editing by S.M. Richard, 1996, 3 diskettes, 22 p.. DBase and Access 95 formats. Can be used in a GIS application.....\$10.00

Digital Information Series 21—Database for Mineral Districts in the State of Arizona, S.M. Richard, editor, 2002, 1 CD-ROM. MS Access database, ESRI shapefiles.....\$30.00

Indexes of Mining Properties

Bulletin 187—Index of Mining Properties in Cochise County, Arizona, by Stanton B. Keith, 1973, 98 p....\$5.00

Bulletin 189—Index of Mining Properties in Pima County, Arizona, by Stanton B. Keith, 1974, 156 p....\$6.00

Bulletin 191—Index of Mining Properties in Santa Cruz County, Arizona, by Stanton B. Keith, 1975 (reprinted 1990), 94 p....\$15.00

Bulletin 192—Index of Mining Properties in Yuma County, Arizona [includes La Paz County], by Stanton B. Keith, 1978, 185 p....\$6.00

Bulletin 196—Mine Index for Metallic Mineral Districts of Arizona, by J.W. Welty, S.J. Reynolds, Stanley B. Keith, D.E. Gest, R.A. Trapp, and Ed DeWitt, 1985, 92 p.....\$7.00

Bibliographies

Circular 24—Bibliography for Metallic Mineral Districts in Cochise, Graham, and Greenlee Counties, Arizona, by Lorraine Schnabel and J.W. Welty, 1986, 38 p....\$6.00

Circular 25—Bibliography for Metallic Mineral Districts in La Paz, Mohave, and Yuma Counties, Arizona, by Lorraine Schnabel and J.W. Welty, 1986, 45 p.....\$6.00

Circular 26—Bibliography for Metallic Mineral Districts in Pima and Santa Cruz Counties, Arizona, by Lorraine Schnabel, J.W. Welty, R.A. Trapp, and S.J. Reynolds, 1986, 44 p.....\$6.00

Circular 27—Bibliography for Metallic Mineral Districts in Gila, Maricopa, Pinal, and Yavapai Counties, Arizona, by J.W. Welty, Ed DeWitt, and Lorraine Schnabel, 1989, 81 p.....\$11.00

Circular 28—Bibliography for Metallic Mineral Districts in Apache, Coconino, and Navajo Counties, Arizona, by J.W. Welty and W.L. Chenoweth, 1989, 47 p.....\$9.00

OFR-88-22—Additions to Bibliographies for Metallic Mineral Districts in Cochise, Graham, Greenlee, La Paz, Mohave, Pima, Santa Cruz, and Yuma Counties, Arizona, by J.W. Welty, 1988, 32 p.....\$5.25

Industrial Minerals

Circular 30—Arizona has Salt!, by S.L. Rauzi, 2001, 40 p.....\$10.00

Special Publication 4—Proceedings of the 21st Forum on the Geology of Industrial Minerals, edited by H.W. Peirce, 1987, 134 p.....\$12.00

Energy Resources

Bulletin 182—Coal, Oil, Natural Gas, Helium, and Uranium in Arizona, by H.W. Peirce, Stanton B. Keith, and J.C. Wilt, 1970, 289 p., 15 sheets....\$10.00

Circular 29—Arizona has Oil & Gas Potential!, by S.L. Rauzi, 2001, 40 p.....\$10.00

Map 15-2—Geothermal Resources of Arizona, by J.C. Witcher, Claudia Stone, and W.R. Hahman, Sr., 1982, scale 1:500,000.....\$5.00

Geologic Maps

Map 17—Index of Published Geologic Maps of Arizona, 1903-1982, by R.B. Scarborough and M.L. Coney, 1982, scale 1:1,000,000, 6 sheets. [See also M-31] All 6 sheets....\$8.00

Map 31—Index of Published Geologic Maps of Arizona: 1982 to mid-1993, by R.C. Harris, R.A. Trapp, T.G. McGarvin, and J.E. Spencer, 1994, 45 p., scale 1:1,000,000, 3 sheets. Text and sheets....\$8.00

Map 33—Arizona Geologic Highway Map, 1998, scale 1:1,000,000. Available as a folded map only....\$10.00

Map 35—Geologic Map of Arizona, by S.M. Richard, S.J. Reynolds, J.E. Spencer, and P.A. Pearthree, compilers, 2000, scale 1:1,000,000. (For rolled map, add \$1.00 for mailing tube. Rolled maps cannot be delivered to P.O. Box)....\$5.00

Digital Geologic Map 01—Digital geologic map and cross sections of the Clifton-Morenci area, Greenlee County, Arizona, v. 1.0, compiled by C.A. Ferguson and M.S. Enders, 2000, 1 CD-ROM....\$15.00
Or purchase as three color, paper maps, scale 1:24,000 (order as **DGM-01, S**)....\$35.50

Digital Geologic Map 31—Geologic Map of the Twin Buttes 7.5' Quadrangle, Pima County, Arizona, v. 1.0, by S.M. Richard, J.E. Spencer, Ann Youberg, and B.J. Johnson, 2003, 1 CD-ROM.... \$15.00
Or purchase as one color map, scale 1:24,000 (order as **DGM-31, S**)....\$18.00

PUBLICATION ORDERING INFORMATION

You may purchase publications at the AZGS office or by mail. Address mail orders to AZGS Publications, 416 W. Congress St., Suite 100, Tucson, AZ 85701 (see www.azgs.az.gov for additional information, or call 520 770-3500 if you have questions). Orders are shipped by UPS, which requires a street address for delivery. All mail orders must be prepaid by a check or money order payable in U.S. dollars to the Arizona Geological Survey or by Master Card or Visa. Do not send cash. Add 7.6% sales tax to the publication cost for orders purchased or mailed in Arizona. Order by publication number and add the following shipping and handling charges to your order:

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| For rolled maps, add \$1.00 for a mailing tube. | | | | | |

Arizona Geological Society

P.O. Box 40952, Tucson, AZ 85717
520-663-5295

www.arizonageologicalsoc.org



Purpose of the Society

is the promotion and encouragement of interest in the science of geology of the state of Arizona. To this end the Society holds monthly meetings, sponsors field trips, and publishes field trip guides and the Digest at irregular intervals. The Society has produced a distinguished publication series, see listing below. AGS was founded in 1948.

Membership

in the Society is open to all who are professionally interested in the geology of the State of Arizona.

Dues: \$15 for 1-year membership
\$30 for 2-year membership,
\$40 for 3-year membership,
full-time student - free



Ores and Orogenesis 2007 - Circum-Pacific Tectonics, Geologic Evolution, and Ore Deposits. A symposium in honor of William R. Dickinson. Location: Tucson, Arizona, 24-30 September, 2007. For more information www.agssymposium.org

Arizona Geological Society Publications - partial listing

The Arizona Geological Society's publications are sold over the counter and by mail through the Arizona Geological Survey. For shipping costs contact Arizona Geological Survey, 416 W. Congress #100, Tucson, AZ 85701, (520)-770-53500, Marie.Madero@azgs.az.gov

GEOLOGIC HIGHWAY MAP OF ARIZONA, edited by R.J. Kamilli and S.M. Richard, scale 1:1,000,000, 1 sheet, 26" x 48", folded to 5" x 9", text and maps both sides, 1998, \$10.00

Digest 20: PORPHYRY COPPER DEPOSITS OF THE AMERICAN CORDILLERA, edited by F.W. Pierce and J.G. Bolm. 656p., 43 papers, hardbound, 1995, \$75.00

Digest 19: PROTEROZOIC GEOLOGY AND ORE DEPOSITS OF ARIZONA, edited by K. E. Karlstrom. 332 p., 25 papers, softbound, 1991, \$35.00

Digest 18: MESOZOIC ROCKS OF S. ARIZONA AND ADJACENT AREAS, edited by W. R. Dickinson & M. A. Klute. 400 p., 28 papers, softbound, 1987, \$ 17.00

Digest 17: GEOLOGIC EVOLUTION OF ARIZONA, edited by J. P. Jenney & S. J. Reynolds. 866 p., 35 papers, hardbound, 1989, 1 plate - Arizona Geologic Map 1988 scale 1:1MM by Reynolds. \$60.00. Includes chapters on Precambrian, Laramide, and Mid Tertiary metalliferous ore deposits, uranium, petroleum, and industrial minerals.

Digest 16: FRONTIERS IN GEOLOGY AND ORE DEPOSITSO F ARIZONA AND THE SOUTHWEST, edited by B. Beatty & P.A.K. Wilkinson. 555 p., 72 papers, softbound, 1986, \$25.00

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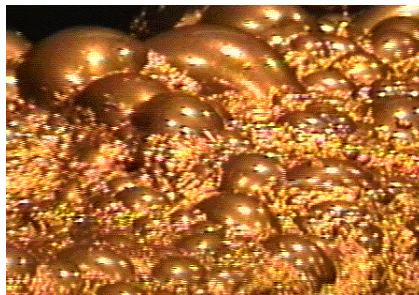


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